

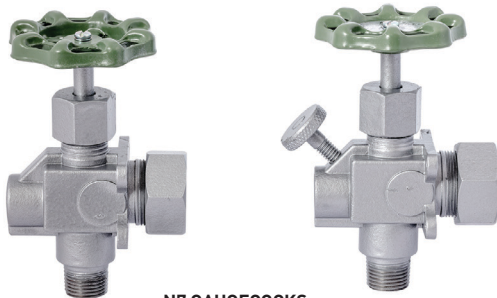


PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

Low to medium pressure gauges and gaugecocks for direct visual identification of liquid levels



N2 GAUGECKS



N7 GAUGECKS

FEATURES

- Reliable, easy to understand level reference.
- Gives users the ability to inspect liquid characteristics visually.
- Non-intrusive.
- No electrical power required. Provide accurate direct liquid level measurement in remote locations where power is not available. Not affected by power failures.
- Provide a near-unlimited length of measure.
- Plain transparent and redline glass available.
- Wide range of glass protectors provide improved protection.
- Glass unions provide superior pressure and temperature ratings.
- Can be supplied to meet ASME requirements.
- Straight and offset pattern gaugecocks available.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the gauge glass.

GENERAL APPLICATION

Used to register liquid levels in low to medium pressure applications in the petroleum, chemical and general process industries, including steam boiler service.

TECHNICAL DATA

Materials	
Glass:	High pressure, heavy wall or red line
Gaugecocks:	Bronze, iron, steel, stainless steel
Glass size:	5/8" and 3/4" (DN 18 and 20)
Connections:	1/2" to 1" (DN 15 to 25)
Pressure ratings	
Glass:	to 600 psi (41.4 bar)
Gaugecocks:	to 750 psi at 100°F (51.7 bar at 38°C)
Temperature rating	
Glass:	to 425°F (218°C)
Gaugecocks:	-300°F to 750°F (-184°C to 399°C)

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

GAUGES

OVERVIEW

Penberthy tubular glass gauges are mounted to the vessel externally and use tubular glass to provide direct visual verification of the liquid level present. The transparent glass also provides an excellent means to inspect fluid characteristics optically.

Liquid enters the gauge through the lower tank connection. The meniscus present in the glass tube corresponds to the liquid level in the tank.

A wide range of accessories allows you to customize each gauge to your specific application requirements. These options can also provide enhanced level indication and protection for the tubular glass.

Protectors

Tubular glass is susceptible to accidental breakage. To counteract this condition, a variety of protectors is offered which prevent damage to the glass but do not restrict level indication capability. In some cases the protector actually enhances it. Protectors can be adapted to fit most major manufacturers' gaugecocks.

Guard rods - Two or four metallic rods placed next to the glass tube.

Plastic or wire glass - A transparent box surrounding the tubular glass constructed from either clear plastic or wire glass.

Sheet metal - Two pieces of sheet metal formed to protect both sides of the tubular glass. The front and back are left open to facilitate easy viewing.

Refractive - An extruded aluminum channel with a choice of either a polymer or glass cover. The interior is a white anodized finish with 45° angle red stripes on the back wall. As the gauge fills, liquid passes in front of the stripes. The refractive nature of the liquid changes the stripe angle showing the highly visible contrast between liquid presence and absence.

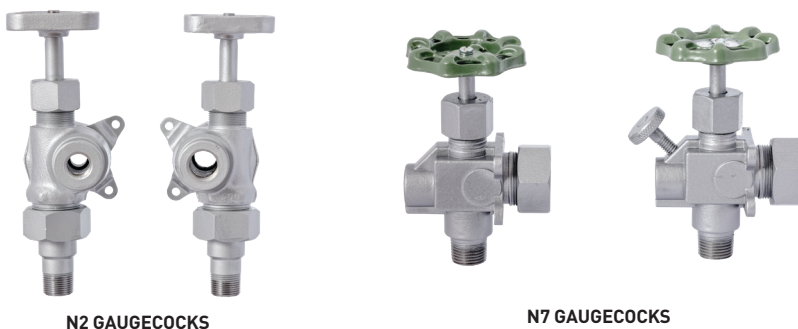
If water is the liquid used, the stripes become horizontal. Liquids with a refractive index less than water will alter the angle less, higher indexes will alter the angles more. The refractive protector is designed for use with standard tubular glass.

Internal heating or cooling tubes

A stainless steel internal heating or cooling tube that passes through the length of the tubular glass can be used in conjunction with an offset pattern gaugecock and high pressure glass.

Glass union

Intended for use in gauges over 48" in height, it allows you to join two pieces of glass within the same gauge. This increases the length of the gauge, yet maintains the same pressure/temperature rating as the individual pieces of glass. Glass unions should be used in conjunction with the refractive protector to provide mechanical stability.



PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

GAUGES

TABLE 1 - PRESSURE/TEMPERATURE RATINGS FOR GAUGES WITH A SINGLE PIECE OF TUBULAR GLASS (BOTH 5/8" AND 3/4")

Center to center distance for vessel connections inch (mm)	No corrosion up to 150°F (66°C) psig (kPa)			Steam boiler service up to 425°F (218°C) psig (kPa)		
	High pressure	Heavy wall	Red line	High pressure	Heavy wall	Red line
10 (254)	410 (2830)	600 (4140)	340 (2340)	310 (2140)	345 (2380)	275 (1900)
15 (381)	385 (2650)	600 (4140)	310 (2140)	280 (1930)	325 (2240)	265 (1830)
20 (508)	355 (2450)	600 (4140)	285 (1960)	265 (1830)	315 (2170)	260 (1790)
25 (635)	300 (2070)	580 (4000)	260 (1790)	250 (1720)	300 (2070)	250 (1720)
30 (762)	275 (1900)	550 (3790)	230 (1590)	-	-	-
35 (889)	240 (1650)	500 (3450)	200 (1380)	-	-	-
40 (1016)	210 (1450)	420 (2890)	180 (1240)	-	-	-
45 (1143)	200 (1380)	360 (2480)	170 (1170)	-	-	-
50 (1270)	180 (1240)	340 (2340)	160 (1100)	-	-	-
55 (1397)	150 (1030)	N/A	140 (970)	-	-	-
60 (1524)	140 (970)	N/A	120 (830)	-	-	-
65 (1651)	125 (860)	N/A	100 (690)	-	-	-
70 (1778)	100 (690)	N/A	90 (620)	-	-	-

Using secured glass unions and multiple pieces of tubular glass will increase the pressure/temperature rating over that of an equivalent length of single glass.

TABLE 2 - TEMPERATURE RATINGS FOR TYPICAL PACKING MATERIAL

Packing Type	Maximum temperature rating °F (°C)
Grafoil® (standard)	425 (218)
Teflon®	425 (218)
Neoprene®	300 (149)
Viton®	400 (204)

TABLE 3 - OPTIONS AVAILABLE FOR THE DIFFERENT TYPES OF TUBULAR GLASS

Glass type (both 5/8" and 3/4")	Options						
	Gaugecocks	Hydraulic adapters	Guard rods	Plastic or wire glass protector	Sheet metal	Refractive protector	Internal tube
High pressure	X	X	X	X	X	X	X
Heavy wall	X	X	X	X	X	-	-
Red line	X	X	X	X	X	-	-
Glass union	X	X	-	-	-	X	X

Hydraulic adapters

Hydraulic adapters are used in place of gaugecocks for connecting the gauge to the vessel. They attach directly to the ends of the tubular glass, providing a 1/2" NPT male connection. This allows you to incorporate most standard hydraulic connections currently available.

Dimensions

To obtain the length of glass tubing needed to make up a gauge set for given vessel center-to-center dimension:

$$\text{Glass tubing length} = (\text{vessel center-to-center dimension}) - (\text{dimension X})$$

To obtain the length of guard rods for given gaugecock center-to-center dimension:

$$\text{Guard rod length} = (\text{gaugecock center-to-center dimension}) - (\text{dimension Y})$$

TUBULAR GLASS DIMENSIONS

Gagecock Model	Required Length (Inches)	
	Tubular Glass	Guard Rods
N2	-1.875	-2.375
K2	-1.875	-2.375
N7	-2.000	-0.750

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

GAUGECKS

OVERVIEW

Penberthy tubular glass gaugecocks are for use in low to medium pressure applications. Available in offset and straight patterns, they isolate the tubular glass from the liquid contents of the vessel.

They are available with a combination of features for a range of uses, including union or solid shank vessel connections and a choice of stuffing box sizes for various glass diameters. All stuffing box connections are designed for positive seal with minimum radial compression.

Gaugecock seat leakage is Class I per ISA RP39.6, FCI 70-2 (formerly ASME B16. 105) and/or IEC 60534-4.

Offset gaugecocks have the advantage of permitting the inside of the tubular glass to be cleaned easily with a minimum of disassembly. By removing the vent and drain plugs (or other connection), a straight passage is opened through the tubular glass. A brush can be inserted through the gaugecock vent and drain for glass cleaning.

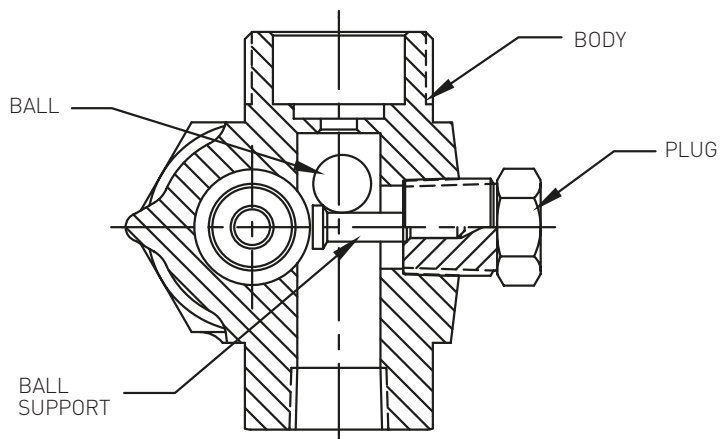
Automatic ball check shut-off

To prevent rapid loss of fluid in the event of accidental glass breakage, Penberthy gaugecocks are supplied with automatic ball check shut-off. Should the glass break, the pressure drop causes the ball checks to seat to prevent loss of tank contents. To unseat these ball checks during the liquid level readings, the tip of the gaugecock stem has an extension that pushes the ball away from its seat while allowing the gauge column to fill as liquid contents pass around the ball. Stainless steel retainers prevent reverse seating of balls or loss of balls during installation.

Both upper and lower gaugecocks in each set are equipped with horizontal ball checks. Balls are located on the vessel side of the gaugecock seats.

Gaugecocks with ball checks omitted meet ASME boiler requirements. As an alternative method to ASME boiler requirements, the lower gaugecock is available with an optional vertical rising ball check located in the offset portion of the gaugecock body and the upper gaugecock has a leaky seat.

VERTICALLY RISING BALL CHECK



PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

SERIES N2/K2 OFFSET PATTERN GAUGECKS

OVERVIEW

The N2 and K2 Series include models N2A/K2A, N2B/K2B and N2C/K2C. They are offered in steel or 316 stainless steel materials, in 1/2" to 1" (DN 15 to 25) sizes, with a 300 P-CL ANSI rating and a wide range of features in offset pattern design.

Pressure (max.): 750 psi at 100°F (51.7 bar at 38°C)
 Temperature range: -300°F to 750°F (-184°C to 399°C)

FEATURES

- Offset pattern allows easy cleaning.
- Integral bonnet (N2 series).
- Union bonnet (K2 series).
- Union vessel connection.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the tubular glass.
- Integral seat (N2 series).
- Threaded renewable seat (K2 series).
- Can be supplied to meet ASME requirements.
- Wide variety of vessel connections available.

A variety of optional features are available when specified. Optional materials can be specified for the gaugecock body and trim (trim consists of the stem, stem packing retainer, ball check and seat [K2 series only]). Standard and optional materials conform to ASTM specifications.

ASME Boiler Code

Series N2 and K2 gaugecock sets that are acceptable for ASME Boiler Code are available as an option.

For steam/water service in excess of 350 psi [24 bar], transparent flat glass gauges with tubular adapters and shields are recommended.

TABLE 4 – CENTER-TO-CENTER AND GUARD ROD DIMENSIONS (SEE DIMENSIONS ON PAGE 6)

Model	Dimension X, in. (cm)	Dimension Y, in. (cm)
All models	1 7/8 (4.8)	2 3/8 (6.0)

TABLE 5 - PRESSURE/TEMPERATURE (SUBJECT TO LIMITATIONS OF TUBULAR GLASS)

Model	Maximum working pressure psi (kPa) at temperatures to:						
	-300°F (-184°C)	-20°F (-29°C)	100°F (38°C)	300°F (149°C)	400°F (204°C)	500°F (260°C)	750°F (399°C)
Steel and 316 STS (N2A/K2A)	675 (4650)	675 (4650)	675 (4650)	610 (4210)	590 (4070)	555 (3830)	400 (2760)
Steel and 316 STS (N2B/K2B, N2C/K2C)	750 (5170)	750 (5170)	750 (5170)	675 (4650)	655 (4520)	610 (4210)	450 (3100)

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECOCKS

SERIES N2/K2 OFFSET PATTERN GAUGECOCKS

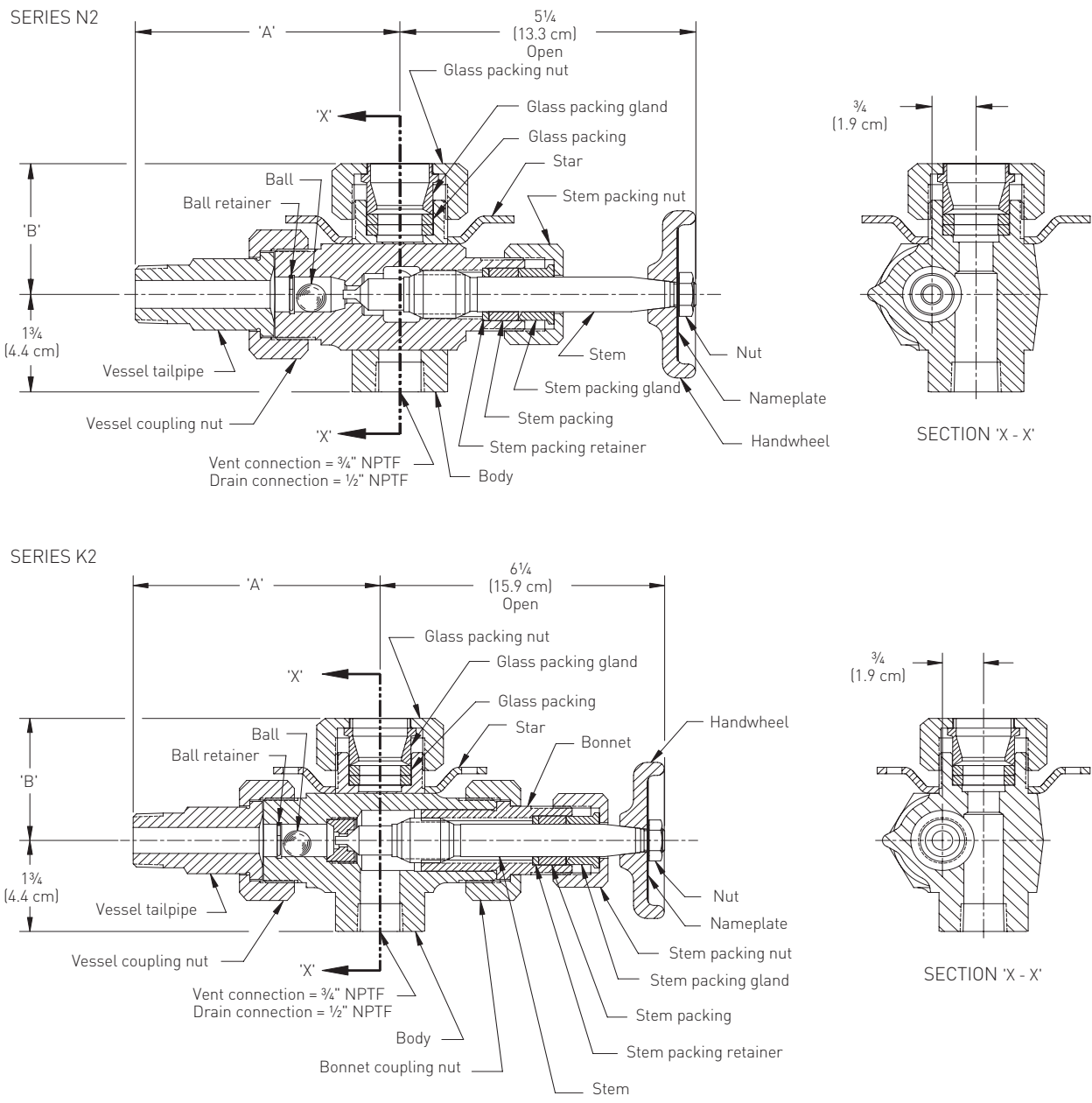


TABLE 6 - N2/K2 DIMENSIONS

Connection	Dimension 'A' in inch (cm)	Dimension 'B' in inch (cm)	Connection	Dimension 'A' in inch (cm)	Dimension 'B' in inch (cm)
Union			Spherical union		
1/2" NPTM	4 3/8 (11.1)	-	1/2" NPTM	4 7/16 (11.6)	-
3/4" NPTM	4 1/2 (11.4)	-	3/4" NPTM	4 7/16 (11.6)	-
1" NPTM	4 5/8 (11.7)	-	Stuffing box		
Socketweld			5/8" Dia. glass	-	2 1/4 (5.7)
1/2" Male union	4 3/8 (11.1)	-	3/4" Dia. glass	-	2 1/4 (5.7)
3/4" Male union	4 1/2 (11.4)	-	Protector nut	-	2 7/8 (7.3)
1" Male union	4 5/8 (11.7)	-			
Flanged					
1/2"-150 P-CL R.F.	4 5/8 (11.7)	-			
1/2"-300 P-CL R.F.	4 5/8 (11.7)	-			
3/4"-150 P-CL R.F.	4 3/4 (12.1)	-			
3/4"-300 P-CL R.F.	4 3/4 (12.1)	-			
1"-150 P-CL R.F.	4 7/8 (12.4)	-			
1"-300 P-CL R.F.	4 7/8 (12.4)	-			

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

SERIES N2/K2 OFFSET PATTERN GAUGECKS

TABLE 7 - SERIES N2 MATERIALS

Ref. no.	Description	Standard materials				Optional materials
		Carbon steel to -20°F	STS construction to -325°F	Sour gas service to -20°F	Low-temp. to -50°F	
11	Body	ASTM A105 (forged) Carbon steel	ASTM A182 (forged) Gr. F316/F316L STS	ASTM A105 (forged) Carbon steel per NACE MR0175 and/or MR0103	ASTM A350 (forged) Carbon steel Gr. LF2 CL. 1	ASTM A351 304/304L STS Gr. CF3 ASTM A351 316/316L STS Gr. CF3M ASTM A182 Gr. F304/F304L STS ASTM A182 Gr. F51 Duplex 2205 STS ASTM A494 Hastelloy B® Gr. N-12MV ASTM A352 Carbon steel Gr. LCC ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel® 400 N04400 ASTM A494 Hastelloy C® Gr. CW12MW ASTM A123 Galvanized steel
12	Vessel tailpipe	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS	ASTM A108 Carbon steel AISI C1018 per NACE MR0175 and/or MR0103	ASTM A350 Carbon steel Gr. LF2 CL. 1	ASTM A276 304/304L, Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276 ASTM A123 galvanized steel
13	Vessel coupling nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS		Investment cast 316 STS	
14	Ball retainer	ASTM A313 316 STS (spring wire)				None
15	T R I M	Ball	ASTM A493, A262 or A276 316 STS			ASTM B574 Hastelloy C® 276 Borosilicate glass ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B164 Monel® 400 ASTM B335 Hastelloy B® CRS 304 STS ASTM A276 Duplex 2205 STS
17		Stem	ASTM A582 416 STS or ASTM A276 410 STS	ASTM A276 316/316L STS	ASTM A276 316/316L STS per NACE MR0175 and/or MR0103	ASTM A582 416 STS or ASTM A276 410 STS
18		Stem packing retainer	MPIF SS-316N2-33 316 STS (sintered)			ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
19	Stem packing gland					
25	Stem packing	Graphite composite				Teflon® Viton®
26	Stem packing nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A276 304/304L, Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276 ASTM A123 galvanized steel
28	Handwheel	ASTM A216 Carbon steel Gr. WCB				None
30	Nut wheel or lever	ASTM A563 Steel Gr. A				None
33	Star	ASTM A108 Carbon steel AISI C1020				None
34	Glass packing	Graphite composite				Teflon® Viton®
36	Glass packing gland	MPIF SS-316N2-33 316 STS (sintered)				ASTM A276 316/316L STS ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
37	Glass packing nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 [CARP 20Cb3]® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276 ASTM A123 Galvanized steel
40	Guard rods	ASTM A108 Carbon steel AISI C1018	ASTM A276 304/304L STS	ASTM A108 Carbon steel AISI C1018	ASTM A276 304/304L STS	None
261	Lever	ASTM A395 Ductile iron				None

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGE COCKS

SERIES N2/K2 OFFSET PATTERN GAUGE COCKS

TABLE 8 - SERIES K2 MATERIALS

Ref. no.	Description	Standard materials				Optional materials	
		Carbon steel to -20°F	STS construction to -325°F	Sour gas service to -20°F	Low-temp. to -50°F		
11	Body	ASTM A105 [forged] Carbon steel	ASTM A182 [forged] Gr. F316/F316L STS	ASTM A105 (forged) Carbon steel per NACE MR0175 and/or MR0103	ASTM A350 [forged] Carbon steel Gr. LF2 Cl. 1	ASTM A351 304/304L STS Gr. CF3 ASTM A351 316/316L STS Gr. CF3M ASTM A182 Gr. F304/F304L STS ASTM A182 Gr. F51 Duplex 2205 STS ASTM A494 Hastelloy B [®] Gr. N-12MV ASTM A352 Carbon steel Gr. LCC ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel [®] 400 N04400 ASTM A494 Hastelloy C [®] Gr. CW12MW ASTM A123 Galvanized steel	
12	Vessel tailpipe	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS	ASTM A108 Carbon steel AISI C1018 per NACE MR0175 and/or MR0103	ASTM A350 Carbon steel Gr. LF2 Cl. 1	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B335 Hastelloy B [®]	
13	Vessel coupling nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS		Investment cast 316 STS	ASTM B574 Hastelloy C [®] 276 ASTM A123 Galvanized steel	
14	Ball retainer	ASTM A313 316 STS (spring wire)				None	
15	T R I M Ball	ASTM A493, A262 or A276 316 STS				ASTM B574 Hastelloy C [®] 276 Borosilicate glass ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B164 Monel [®] 400 ASTM B335 Hastelloy B [®] CRS 304 STS ASTM A276 Duplex 2205 STS	
16		Seat	ASTM A276 316/316L STS				ASTM A276 316/316L STS
17		Stem	ASTM A582 416 STS or ASTM A276 410 STS	ASTM A276 316/316L STS	ASTM A276 316/316L STS per NACE MR0175 and/or MR0103	ASTM A582 416 STS or ASTM A276 410 STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®]
18	Stem packing retainer	MPIF SS-316N2-33 316 STS (sintered)				ASTM B335 Hastelloy B [®] ASTM B574 Hastelloy C [®] 276	
19	Stem packing gland						
20	Bonnet	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS	ASTM A108 Carbon steel AISI C1018 per NACE MR0175 and/or MR0103	ASTM A350 Carbon steel Gr. LF2 Cl. 1	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B335 Hastelloy B [®]	
21	Bonnet Nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS	ASTM B574 Hastelloy C [®] 276 ASTM A123 Galvanized steel	
25	Stem packing	Graphite composite				Teflon [®] Viton [®]	
26	Stem packing nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A108 Carbon steel AISI C1018	Investment cast 316/316L STS	ASTM A276 304/304L, Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B335 Hastelloy B [®] ASTM B574 Hastelloy C [®] 276 ASTM A123 Galvanized steel	
28	Handwheel	ASTM A216 Carbon steel Gr. WCB				None	
30	Nut wheel or lever	ASTM A563 Steel Gr. A				None	
33	Star	ASTM A108 Carbon steel AISI C1020				None	
34	Glass packing	Graphite composite				Teflon [®] Viton [®]	
36	Glass packing gland	MPIF SS-316N2-33 316 STS (sintered)				ASTM A276 316/316L STS ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B335 Hastelloy B [®] ASTM B574 Hastelloy C [®] 276	
37	Glass packing nut	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS	ASTM A108 Carbon steel AISI C1018	Investment cast 316 STS	ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel [®] 400 ASTM B473 Alloy 20 [CARP 20Cb3] [®] ASTM B335 Hastelloy B [®] ASTM B574 Hastelloy C [®] 276 ASTM A123 Galvanized steel	
40	Guard rods	ASTM A108 Carbon steel AISI C1018	ASTM A276 304/304L STS	ASTM A108 Carbon steel AISI C1018	ASTM A276 304/304L STS	None	
261	Lever	ASTM A395 Ductile iron				None	

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

SERIES N2/K2 OFFSET PATTERN GAUGECKS

TABLE 9 - SERIES N2/K2 STANDARD/OPTIONAL FEATURES

Feature	N2A		K2A		N2B		K2B		N2C		K2C	
	Std.	Opt.	Std.	Opt.	Std.	Opt.	Std.	Opt.	Std.	Opt.	Std.	Opt.
Pattern												
Offset	X	-	X	-	X	-	X	-	X	-	X	-
Bonnet												
Integral	X	-	-	-	X	-	-	-	X	-	-	-
Union	-	-	X	-	-	-	X	-	-	-	X	-
Gauge connection												
Stuffing box	5/8" glass diameter	X	-	X	-	-	-	-	-	-	-	-
	3/4" glass diameter	-	-	-	-	X	-	X	-	X	-	X
Vessel connection												
Union	1/2" NPTM	X	-	X	-	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	X	-	X	-	-	-	-
	1" NPTM (non floating)	-	-	-	-	-	-	-	-	X	-	X
Solid shank	1/2" NPTM	-	X	-	X	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	-	X	-	X	-	-	-
	1" NPTM	-	-	-	-	-	-	-	-	-	X	X
Socketweld	1/2" Male	-	X	-	X	-	-	-	-	-	-	-
	3/4" Male	-	-	-	-	-	X	-	X	-	-	-
	1" Male	-	-	-	-	-	-	-	-	-	X	X
Flanged	-	X	-	X	-	X	-	X	-	X	-	X
Spherical union	1/2" NPTM	-	X	-	X	-	-	-	-	-	-	-
	3/4" NPTM	-	-	-	-	-	X	-	X	-	-	-
Vent connection												
3/4" NPTF	X	-	X	-	X	-	X	-	X	-	X	-
Drain connection												
1/2" NPTF	X	-	X	-	X	-	X	-	X	-	X	-
Ball check shut-off												
Horizontal lower and upper gaugecocks	X	-	X	-	X	-	X	-	X	-	X	-
Vertical lower/horizontal upper gaugecocks*	-	X	-	X	-	X	-	X	-	X	-	X
Omitted*	-	X	-	X	-	X	-	X	-	X	-	X
Vacuum - horizontal upper and lower	-	X	-	X	-	X	-	X	-	X	-	X
Seat												
Integral	X	-	-	-	X	-	-	-	X	-	-	-
Threaded (renewable)	-	-	X	-	-	-	X	-	-	-	X	-
Backseating	-	-	-	X	-	-	-	X	-	-	-	X
Handwheel												
w/ standard pitch threads	X	-	X	-	X	-	X	-	X	-	X	-
w/ quick closing threads	-	X	-	X	-	X	-	X	-	X	-	X
Lever												
w/ quick closing thread (1/4 turn)	-	X	-	X	-	X	-	X	-	X	-	X
Guard rods (4 per gaugecock set)												
1/4" (6.4 mm) diameter	-	X	-	X	-	X	-	X	-	X	-	X

* Acceptable for ASME service

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

SERIES N7 STRAIGHT PATTERN GAUGECKS

OVERVIEW

The N7 series consists of model N7A and N7B. They are offered in a choice of bronze, iron, steel and stainless steel constructions, in 1/2" to 3/4" (DN 15 to 20) sizes with a wide range of features in straight pattern design.

Pressure (max.): 500 psi at 100°F (34.5 bar at 38°C)
 Temperature range: -20°F to 500°F (-29°C to 260°C)

FEATURES

- Straight pattern.
- Integral bonnet.
- Rigid vessel connection.
- Ball check shut-off prevents loss of process fluid in the event of an accidental breakage of the tubular glass.
- Integral drain cock.
- Variety of vessel connections available.

A variety of optional features are available when specified. Combinations of optional features and materials are available. Each combination is designated by the model number in the features table. Optional materials can be specified for the gaugecock body and trim (trim consists of the stem, stem packing retainer and ball check). Standard and optional materials are available for service as described by ASTM Specifications.

ASME Boiler Code

Series N7 gaugecock sets that are acceptable for ASME Boiler Code are available as an option. These gaugecock sets have a vertical rising ball check shut-off in the lower gaugecock and a horizontal ball in the upper gaugecock.

TABLE 15 – CENTER-TO-CENTER AND GUARD ROD DIMENSIONS (SEE DIMENSIONS ON PAGE 3)

Model	Dimension X, in. (cm)	Dimension Y, in. (cm)
All models	2 (5.1)	3/4 (1.9)

TABLE 16 - PRESSURE/TEMPERATURE (SUBJECT TO LIMITATIONS OF TUBULAR GLASS)

Model	Maximum working pressure, psi (kPa) at temperatures to:							Max. steam pressure
	With standard Neoprene glass packing				With optional Teflon® glass packing			
	-20°F (-29°C)	100°F (38°C)	200°F (93°C)	300°F (149°C)	400°F (204°C)	450°F (232°C)	500°F (260°C)	
Bronze								
N7A	200 (1380)	200 (1380)	190 (1310)	165 (1140)	125 (860)	-	-	125 (860)
N7B	400 (2760)	400 (2760)	385 (2650)	335 (2310)	250 (1720)	-	-	250 (1720)
Ductile iron								
N7A, N7B	500 (3450)	500 (3450)	460 (3170)	375 (2580)	290 (2000)	250 (1720)	-	350 (2410)
STL, STS								
N7A, N7B	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	500 (3450)	350 (2410)

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKOCKS

SERIES N7 STRAIGHT PATTERN GAUGECKOCKS

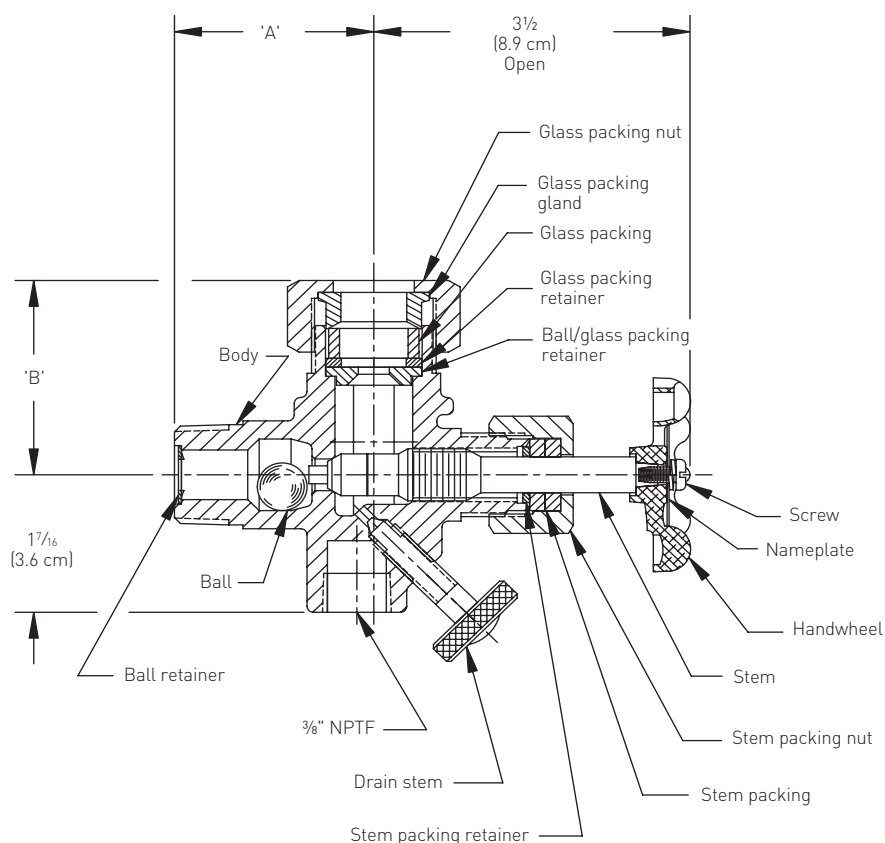


TABLE 17 - SERIES N7 DIMENSIONS

Connection	Dimension 'A' in inch (cm)	Dimension 'B' in inch (cm)
Solid shank		
1/2" NPTM	2 (5.1)	-
3/4" NPTM	2 (5.1)	-
Socketweld		
1/2" Male	2 (5.1)	-
3/4" Male	2 (5.1)	-
Flanged		
1/2"-150 P-CL R.F.	2 1/4 (5.7)	-
1/2"-300 P-CL R.F.	2 1/4 (5.7)	-
3/4"-150 P-CL R.F.	2 1/4 (5.7)	-
3/4"-300 P-CL R.F.	2 1/4 (5.7)	-
Stuffing box		
5/8" Dia. glass	-	2 (5.1)
3/4" Dia. glass	-	2 (5.1)
Protector nut	-	2 5/8 (6.7)

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGE COCKS

SERIES N7 STRAIGHT PATTERN GAUGE COCKS

TABLE 18 - SERIES N7 MATERIALS

Ref. no.	Description	Standard materials				Optional materials
		Bronze to -20°F	Carbon steel to -20°F	Iron to -20°F	STS construction to -325°F	
11	Body	ASME SB584 UNS C89836 Bronze	ASTM A216 Carbon steel Gr. WCB	ASTM A395 Ductile iron	ASTM A351 316/316L STS Gr. CF3M	ASTM A351 304/304L STS Gr. CF3 ASTM A890 Duplex 2205 STS Gr. 4A ASTM A494 Hastelloy B® Gr. N-12MV ASTM A743 Alloy 20 Gr. CN7M ASTM B564 Monel® 400 N04400 ASTM A494 Hastelloy C® Gr. CW12MW
14	Ball retainer	18-8 STS (302-304 STS)				None
15	T R I M	Ball	316 Stainless steel		ASTM A493, A262 or A276 316 STS	ASTM B574 Hastelloy C® 276 Borosilicate glass ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B164 Monel® 400 ASTM B335 Hastelloy B® CRS 304 STS ASTM A276 Duplex 2205 STS
17		Stem	ASME SB171 CA Alloy 464 Bronze	ASTM A582 416 STS		ASTM A276 316/316L STS
18		Stem packing retainer	ASTM B291 Sheet brass	ASTM A240 sheet 316 STS		ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
25	Stem packing	Graphite composite				Teflon® Viton® Neoprene
26	Stem packing nut	ASME SB171 CA Alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS		ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
28	Handwheel	ASTM B85 Aluminum				None
34	Glass packing	Neoprene®				Teflon® Viton® Graphite composite
35	Glass packing retainer	ASTM A240 sheet 316 STS				ASTM A276 316/316L STS ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)®
35A	Vertical ball seat/glass retainer	MPIF SS-316N2-33 316 STS (sintered)				ASTM B335 Hastelloy B®
36	Glass packing gland	MPIF CT-1000-K26 Bronze (sintered)	MPIF SS-316N2-33 316 STS (sintered)			ASTM B574 Hastelloy C® 276
37	Glass packing nut	ASME SB171 CA alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS		ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
40	Guard rods	ASTM B21 CA alloy 464 Naval brass			ASTM A582 303 STS	None
47	Drain stem	ASME SB171 CA alloy 464 Bronze	ASTM A108 Carbon steel AISI C1018	ASTM A276 316/316L STS		ASTM A276 304/304L STS ASTM A276 Duplex 2205 STS ASTM B164 Monel® 400 ASTM B473 Alloy 20 (CARP 20Cb3)® ASTM B335 Hastelloy B® ASTM B574 Hastelloy C® 276
100	Handwheel screw	ASTM B633 Zinc plated Carbon steel				None

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

SERIES N7 STRAIGHT PATTERN GAUGECKS

TABLE 19 - SERIES N7 STANDARD/OPTIONAL FEATURES

Feature	N7A		N7B	
	Std.	Opt.	Std.	Opt.
Pattern				
Straight	X	-	X	-
Bonnet				
Integral	X	-	X	-
Gauge connection				
Stuffing box	5/8" glass diameter	X	-	-
	3/4" glass diameter	-	-	X
Vessel connection (solid shank)				
Threaded	1/2" NPTM	X	-	-
	3/4" NPTM	-	-	X
Socketweld	1/2" Male	-	X	-
	3/4" Male	-	-	X
Flanged	-	X	-	X
Drain connection				
3/8" NPTF	X	-	X	-
Ball check shut-off				
Horizontal lower and upper gaugecocks (iron, STL, STS)	X	-	X	-
Vertical lower/horizontal upper (bronze)	X	-	X	-
Vertical lower/horizontal upper*	-	X	-	X
Omitted*	-	X	-	X
Ball inspection plug**				
Furnished	-	X	-	X
Omitted	X	-	X	-
Seat				
Integral	X	-	X	-
Handwheel				
w/ standard pitch thread (iron, STL, STS)	X	-	X	-
w/ quick closing threads (bronze)	X	-	X	-
Drain cock				
Integral	X	-	X	-
Polished body				
Bronze	-	X	-	X
Guard rods (4 per gaugecock set)				
3/16" (4.8 mm) diameter	-	X	-	X

* Acceptable for ASME service

** Required for ASME service

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGE COCKS ACCESSORIES

GLASS UNION

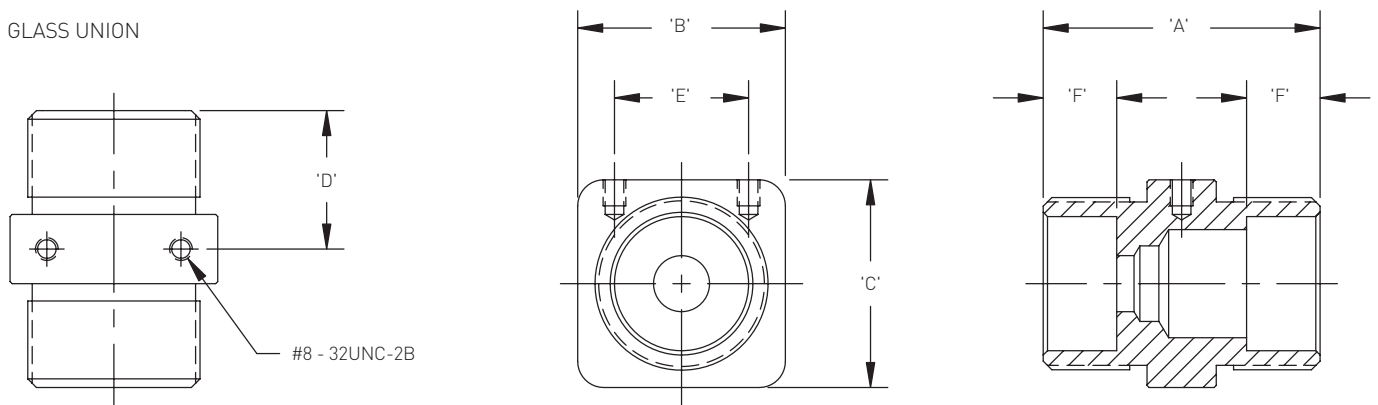


TABLE 20 - GLASS UNION DIMENSIONS

Size	Material	Dimensions in inch (cm)					
		A	B	C	D	E	F
5/8" and 3/4"	Carbon steel, brass and 316 STS	2 [5.1]	1 1/2 [3.8]	1 1/2 [3.8]	1 [2.5]	3 1/32 [2.5]	17/32 [1.3]

HYDRAULIC ADAPTER

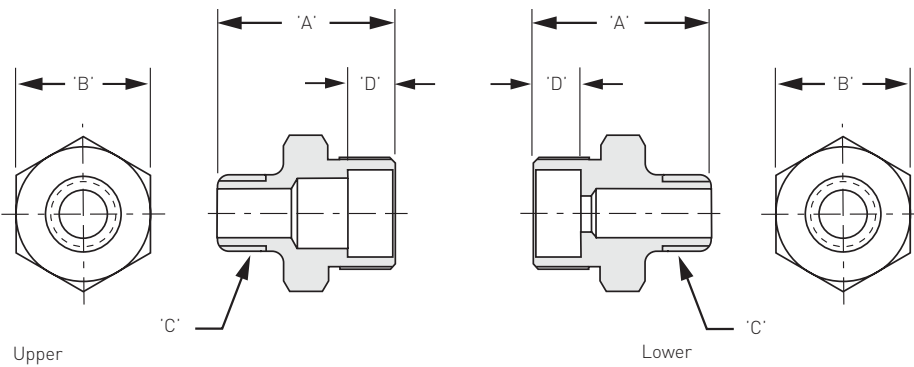


TABLE 21 - HYDRAULIC ADAPTER DIMENSIONS

	Size	Material	Dimensions in inch (cm)			
			A	B	C	D
Upper adapter	5/8" and 3/4"	Carbon steel, brass and 316 STS	1 49/64 [5.0]	1 1/2 [3.8]	1/2 NPT	17/32 [1.3]
Lower adapter	5/8" and 3/4"	Carbon steel, brass and 316 STS	1 49/64 [5.0]	1 1/2 [3.8]	1/2 NPT	17/32 [1.3]

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGE COCKS ACCESSORIES

TABLE 22 - ACCESSORIES MATERIALS

Ref. no.	Part description	Standard materials			Optional materials
Glass union					
34	Glass packing	Neoprene®, Max. 300°F			Grafoil®, Max. 500°F Teflon®, Max. 500°F Viton®, Max. 400°F
35	Glass packing retainer	ASTM A240 sheet 316 STS			None
36	Glass packing gland	MPIF SS-316N2-33 316 STS (sintered)			None
37	Glass packing nut	ASTM A108 Carbon steel AISI C1018	ASTM B21 CA Alloy 464 Naval brass	ASTM A276 316/316L STS	None
100	Screw	18-8 (304) STS			None
134	Adapter	ASTM A108 Carbon steel AISI C1018	ASTM B21 CA Alloy 464 Naval brass	ASTM A240 316L STS	None
Hydraulic adapter					
11	Body	ASTM A108 Carbon steel AISI C1018	ASTM B21 CA Alloy 464 Naval brass	ASTM A276 316/316L STS	None
34	Glass packing	Neoprene®, Max. 300°F			Grafoil®, Max. 500°F Teflon®, Max. 500°F Viton®, Max. 400°F
35	Glass packing retainer	ASTM A240 sheet 316 STS			None
36	Glass packing gland	MPIF SS-316N2-33 316 STS (sintered)			None
37	Glass packing nut	ASTM A108 Carbon steel AISI C1018	ASTM B21 CA Alloy 464 Naval brass	ASTM A276 316/316L STS	None
Refractive protector					
4	Nut	ASTM A563 Gr. A steel, zinc plated			None
4A	Nut	Brass (knurled)			None
48	Glass	Annealed glass			PMMA (Acrylic sheet)
77	End	Aluminum Gr. G4A			None
100	Screw	18-8 (304) STS			None
100A	Screw	ASTM A449 steel, zinc plated			None
137	U-bolt	Aluminum Alloy 6061			None
293	Extrusion	Aluminum Alloy UNS #A96063			None

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGECKS

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Example:	N2A	S	S	X	C	A	X	D	E	A	C	A	G	G	S	S	XXX
Model																	
N2A Model N2A tubular gaugecock																	
N2B Model N2B tubular gaugecock																	
N2C Model N2C tubular gaugecock																	
K2A Model K2A tubular gaugecock																	
K2B Model K2B tubular gaugecock																	
K2C Model K2C tubular gaugecock																	
N7A Model N7A tubular gaugecock																	
N7B Model N7B tubular gaugecock																	
Body material																	
C Carbon steel (N7, N2, K2 only)																	
S 316/316L SST (N7, N2, K2 only)																	
B Bronze (N7 only)																	
G Ductile iron (N7 only)																	
A Alloy 20 (N7, N2, K2 only)																	
M Monel® (N7, N2, K2 only)																	
H Hastelloy 'C'® (N7, N2, K2 only)																	
F 304/304L SST (N7, N2, K2 only)																	
Trim material																	
C 416 SST (standard on Carbon steel and ductile iron body)																	
S 316/316L SST (standard on 316 SST body, N7, N2, K2 only)																	
B Bronze (standard on bronze body, N7 only)																	
A Alloy 20 (N7, N2, K2 only)																	
M Monel® (N7, N2, K2 only)																	
H Hastelloy 'C'® (N7, N2, K2 only)																	
F 304/304L SST (N7, N2, K2 only)																	
NACE MR-01-75 and/or MR-0103																	
X None																	
E NACE environmental																	
Vessel connection size																	
C ½"																	
E ¾"																	
F 1"																	
Vessel connection type																	
A NPT male union																	
B NPT female union																	
C Socket weld male union																	
D Socket weld female union																	
E Spherical union NPT male																	
J Solid shank NPT male																	
K Solid shank SW male																	
N Raised face SO																	
P Flat face SO																	
Pressure class (if flanged)																	
X None																	
1 P CL 150																	
3 P CL 300																	
6 P CL 600																	
Gauge connection size																	
D ⅝"																	
E ¾"																	

PENBERTHY TUBULAR GLASS LIQUID LEVEL GAUGES AND GAUGE COCKS

SELECTION GUIDE - PART 2

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SELECTION GUIDE - PART 2

N2A	S	S	X	C	A	X	D	Example:	E	A	C	A	G	G	S	S	XXX
								Vent connection size									
								X None [standard on N7]									
								B 3/8"									
								C 1/2"									
								E 3/4" [standard on N2, K2]									
								Vent connection type									
								X None [standard on N7]									
								A NPT female [standard on N2, K2]									
								B Socket weld female									
								F Plugged									
								Drain connection size									
								X None									
								B 3/8" [standard on N7]									
								C 1/2" [standard on N2, K2]									
								E 3/4"									
								Drain connection type									
								X None									
								A NPT female [standard]									
								B Socket weld female									
								F Plugged									
								G Drain cock									
								Stem packing material									
								N Neoprene®									
								G Grafoil® [standard]									
								T Teflon®									
								V Viton®									
								Glass packing material									
								N Neoprene [standard on N7]									
								G Grafoil® [standard on N2, K2]									
								T Teflon®									
								V Viton®									
								Stem operation									
								S Standard close w/ handwheel [standard]									
								A Quick close w/ lever									
								B Quick close w/ handwheel									
								C Standard close, back seat w/ handwheel [N2,K2 only]									
								D Quick close, back seat w/ lever [N2,K2 only]									
								E Quick close, back seat w/ handwheel [N2,K2 only]									
								F Standard close w/ lever									
								Paint specification									
								X None									
								S Standard									
								Options									
								XXX None									
								* Smooth body [N7 only]									
								* Wire glass, plastic or sheet metal protector									
								* Horizontal ball check									
								* Vertical rise ball check lower gaugecock									
								* ASME vertical rise ball check lower gaugecock plug									
								* Ball check shut off omitted [ASME]									
								* Vacuum service vessel connection [N2,K2 only]									

NOTES

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* Option code assigned at time of order

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